

CLAIMS

What is claimed is:

1. A memory cell comprising:

a first line formed over a substrate, the first line being formed of a first conductive material;

a layer of a second conductive material disposed over the first line, the second conductive material being different from the first conductive material;

a layer of chalcogenide material disposed over the layer of the second conductive material; and

a second line formed over the layer of chalcogenide material.

2. The memory cell, as set forth in claim 1, wherein the first line is embedded in the substrate.

3. The memory cell, as set forth in claim 1, wherein the first line is disposed in a window formed in a dielectric layer disposed over the substrate.

4. The memory cell, as set forth in claim 1, wherein the first conductive material comprises at least one of copper, nickel, and tungsten.

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4/5. The memory cell, as set forth in claim 1, wherein the layer of a second conductive material is deposited on the first line using an immersion plating technique.

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6/6. The memory cell, as set forth in claim 1, wherein the second conductive material comprises at least one of silver and gold.

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6/7. The memory cell, as set forth in claim 1, wherein the chalcogenide material comprises germanium selenide having ions of the second conductive material therein.

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7/8. A memory cell comprising:

a first line disposed over a substrate, the first line being formed of a first metal;

a layer of conductive material disposed over the first line, the layer of conductive material being formed of a second metal, the second metal being more noble than the first metal;

a layer of chalcogenide material disposed over the layer of conductive material; and

a second line disposed over the layer of chalcogenide.

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8 9. The memory cell, as set forth in claim ⁷8, wherein the first line is embedded in the substrate.

10 10. The memory cell, as set forth in claim ⁷8, wherein the first line is disposed in a window formed in a dielectric layer disposed over the substrate.

15 11. The memory cell, as set forth in claim ⁷8, wherein the first metal comprises at least one of copper, nickel, and tungsten.

20 12. The memory cell, as set forth in claim ⁷8, wherein the layer of conductive material is deposited on the first line using an immersion plating technique.

12 13. The memory cell, as set forth in claim ⁷8, wherein the second metal comprises at least one of silver and gold.

13/14. The memory cell, as set forth in claim ⁷8, wherein the first metal comprises copper and wherein the second metal comprises silver.

5 14/15. The memory cell, as set forth in claim ⁷8, wherein the chalcogenide material comprises germanium selenide having ions of the second metal therein.

15/16. A memory cell comprising:

a first line formed over a substrate, the first line comprising copper;

a layer of silver disposed over the first line;

a layer of chalcogenide material disposed over the layer of silver, the chalcogenide material having ions of silver therein; and

a second line disposed over the layer of chalcogenide.

20 SUB 17. The memory cell, as set forth in claim 1, wherein the first line is embedded in the substrate.

18. The memory cell, as set forth in claim 1, wherein the first line is disposed in a window formed in a dielectric layer disposed over the substrate.

19. The memory cell, as set forth in claim 1, wherein the layer of silver is deposited on the first line using an immersion plating technique.

20. The memory cell, as set forth in claim 1, wherein the chalcogenide material comprises germanium selenide.

21. A memory cell comprising:

a first layer of dielectric material disposed over a substrate, the first layer of dielectric material having a first window therein;

a first line disposed in the first window, the first line being formed of a first conductive material;

a second layer of dielectric material disposed over the first layer of dielectric material and over the first line, the second layer of dielectric material having a second window therein, the second window exposing at least a portion of the first line;

B27 a layer of a second conductive material disposed in the second window over the first line,
the second conductive material being different from the first conductive material;

5 a layer of chalcogenide material disposed in the second window over the layer of the
second conductive material; and

a second line formed over the layer of chalcogenide material.

10 ~~22.~~ The memory cell, as set forth in claim 21, wherein the first conductive material
comprises at least one of copper, nickel, and tungsten.

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21 ~~23.~~ The memory cell, as set forth in claim ~~21~~²⁰, wherein the layer of a second
15 conductive material is deposited on the first line using an immersion plating technique.

22 ~~24.~~ The memory cell, as set forth in claim ~~21~~²⁰, wherein the second conductive material
comprises at least one of silver and gold.

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23 ~~25.~~ The memory cell, as set forth in claim ~~21~~²⁰, wherein the chalcogenide material
comprises germanium selenide having ions of the second conductive material therein.

26. A memory cell comprising:

a first layer of dielectric material disposed over a substrate, the first layer of dielectric material having a first window therein;

a first line disposed in the first window, the first line being formed of a first conductive material;

a second layer of dielectric material disposed over the first layer of dielectric material and over the first line;

first layer of conductive material disposed over the second layer of dielectric material, the first layer of conductive material and the second layer of dielectric material having a second window therein, the second window exposing at least a portion of the first line;

a layer of a second conductive material disposed in the second window over the first line, the second conductive material being different from the first conductive material;

a layer of chalcogenide material disposed in the second window over the layer of the second conductive material; and

a second line formed over the layer of chalcogenide material and over the first layer of
conductive material.

5 ~~27.~~ The memory cell, as set forth in claim 26, wherein the first conductive material
comprises at least one of copper, nickel, and tungsten.

10 ~~28.~~ The memory cell, as set forth in claim ~~26~~²⁷, wherein the layer of a second
conductive material is deposited on the first line using an immersion plating technique.

15 ~~29.~~ The memory cell, as set forth in claim ~~26~~²⁷, wherein the second conductive material
comprises at least one of silver and gold.

20 ~~30.~~ The memory cell, as set forth in claim ~~26~~²⁷, wherein the chalcogenide material
comprises germanium selenide having ions of the second conductive material therein.

31. A memory comprising:

a memory array having a plurality of memory cells, each of the memory cells comprising:

a first line formed over a substrate, the first line being formed of a first conductive material;

a layer of a second conductive material disposed over the first line, the second conductive material being different from the first conductive material;

a layer of chalcogenide disposed over the layer of the second conductive material; and

a second line formed over the layer of chalcogenide.

32. The memory cell, as set forth in claim 31, wherein the first line is embedded in the substrate.

33. The memory cell, as set forth in claim 31, wherein the first line is disposed in a window formed in a dielectric layer disposed over the substrate.

34. The memory cell, as set forth in claim 31, wherein the first conductive material comprises at least one of copper, nickel, and tungsten.

35. The memory cell, as set forth in claim 31, wherein the layer of a second conductive material is deposited on the first line using an immersion plating technique.

36. The memory cell, as set forth in claim 31, wherein the second conductive material comprises at least one of silver and gold.

37. The memory cell, as set forth in claim 31, wherein the chalcogenide material comprises germanium selenide having ions of the second conductive material therein.

38. An electronic device comprising:

a processor;

a memory operatively coupled to the processor, the memory comprising a memory array having a plurality of memory cells, each of the memory cells comprising:

a first line formed over a substrate, the first line being formed of a first conductive material;

a layer of a second conductive material disposed over the first line, the second conductive material being different from the first conductive material;

a layer of chalcogenide disposed over the layer of the second conductive material; and

a second line formed over the layer of chalcogenide.

35 39. The memory cell, as set forth in claim 38, wherein the first line is embedded in the substrate.

36 40. The memory cell, as set forth in claim 38, wherein the first line is disposed in a window formed in a dielectric layer disposed over the substrate.

41. The memory cell, as set forth in claim 38, wherein the first conductive material comprises at least one of copper, nickel, and tungsten.

37 42. The memory cell, as set forth in claim 38, wherein the layer of a second conductive material is deposited on the first line using an immersion plating technique.

38 43. The memory cell, as set forth in claim 38, wherein the second conductive material comprises at least one of silver and gold.

39 44. The memory cell, as set forth in claim 38, wherein the chalcogenide material comprises germanium selenide having ions of the second conductive material therein.

45. A method of fabricating a memory cell, the method comprising the acts of:

- (a) disposing a first line over a substrate, the first line being formed of a first metal;
- (b) plating the first line with a second metal;
- (c) disposing a layer of chalcogenide material over the second metal;
- (d) transferring ions of the second metal into the chalcogenide material; and

- (e) disposing a second line over the layer of chalcogenide material, the second line being formed of a third metal.

5 46. The method, as set forth in claim 45, wherein act (a) comprises the act of:

disposing at least one of copper, nickel, and tungsten over the substrate.

10 47. The method, as set forth in claim 45, wherein act (b) comprises the act of:

using immersion plating to plate the second metal onto the first line.

15 48. The method, as set forth in claim 47, wherein the second metal comprises silver.

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49. The method, as set forth in claim 45, wherein act (c) comprises the act of:

20 disposing germanium selenide over the second metal.

50. The method, as set forth in claim 45, wherein act (d) comprises the act of:

heating the second metal and the chalcogenide material.

51. The method, as set forth in claim 45, wherein act (d) comprises the act of:

irradiating the second metal and the chalcogenide material with ultraviolet radiation.

52. The method, as set forth in claim 45, wherein acts (a) through (e) are performed in the order recited.

53. A method of fabricating a memory cell, the method comprising the acts of:

(a) disposing a layer of dielectric material over a substrate;

(b) forming a window in the layer of dielectric material;

(c) disposing a first metal in the window;

(d) plating the first metal with a second metal;

- (e) disposing a layer of chalcogenide material over the second metal;
- (f) transferring ions of the second metal into the chalcogenide material; and
- 5 (g) disposing a third metal over the layer of chalcogenide material.

54. The method, as set forth in claim 53, wherein act (a) comprises the act of:
10 disposing a layer of oxide over the substrate.

55. The method, as set forth in claim 53, wherein act (c) comprises the act of:
15 disposing at least one of copper, nickel, and tungsten in the window.

56. The method, as set forth in claim 53, wherein act (d) comprises the act of:
20 using immersion plating to plate the second metal onto the first metal.

57. The method, as set forth in claim 56, wherein the second metal comprises silver.

58. The method, as set forth in claim 53, wherein act (e) comprises the act of:

disposing germanium selenide over the second metal.

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59. The method, as set forth in claim 53, wherein act (f) comprises the act of:

heating the second metal and the chalcogenide material.

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60. The method, as set forth in claim 53, wherein act (f) comprises the act of:

irradiating the second metal and the chalcogenide material with ultraviolet radiation.

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61. The method, as set forth in claim 53, wherein acts (a) through (g) are performed in the order recited.

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62. A method of fabricating a memory cell, the method comprising the acts of:

(a) disposing a first layer of dielectric material on a substrate;

- (b) forming a first window in the first layer of dielectric material;
- (c) disposing a first metal in the first window;
- 5 (d) disposing a second layer of dielectric material over the first metal and the first layer of dielectric material;
- (e) forming a second window in the second layer of dielectric material to expose at least a portion of the first metal in the first window;
- (f) plating the first metal exposed by the second window with a second metal;
- (g) disposing a layer of chalcogenide material over the second metal;
- 10 (h) transferring ions of the second metal into the chalcogenide material; and
- 15 (i) disposing a third metal over the layer of chalcogenide material.

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20 63. The method, as set forth in claim 62, wherein act (a) comprises the act of:

disposing a layer of oxide over the substrate.

64. The method, as set forth in claim 62, wherein act (c) comprises the act of:

disposing at least one of copper, nickel, and tungsten in the window.

65. The method, as set forth in claim 62, wherein act (d) comprises the act of:

disposing a layer of silicon nitride over the first metal and the first layer of dielectric material.

66. The method, as set forth in claim 62, wherein act (f) comprises the act of:

using immersion plating to plate the second metal onto the first metal.

67. The method, as set forth in claim 66, wherein the second metal comprises silver.

68. The method, as set forth in claim 62, wherein act (g) comprises the act of:

disposing germanium selenide over the second metal.

69. The method, as set forth in claim 62, wherein act (h) comprises the act of:

heating the second metal and the chalcogenide material.

70. The method, as set forth in claim 62, wherein act (h) comprises the act of:

irradiating the second metal and the chalcogenide material with ultraviolet radiation.

71. The method, as set forth in claim 62, wherein acts (a) through (i) are performed in the order recited.

72. A method of fabricating a memory cell, the method comprising the acts of:

(a) disposing a first layer of dielectric material on a substrate;

(b) forming a first window in the first layer of dielectric material;

(c) disposing a first metal in the first window;

- (d) disposing a second layer of dielectric material over the first metal and the first layer of dielectric material;
- (e) disposing a layer of a second metal over the second layer of dielectric material
- (f) forming a second window in the second layer of dielectric material and in the layer of the second metal to expose at least a portion of the first metal in the first window;
- (g) plating the first metal exposed by the second window with a third metal;
- (h) disposing a layer of chalcogenide material over the third metal;
- (i) transferring ions of the third metal into the chalcogenide material; and
- (j) disposing a fourth metal over the layer of chalcogenide material.

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73. The method, as set forth in claim 72, wherein act (a) comprises the act of:

disposing a layer of oxide over the substrate.

74. The method, as set forth in claim 72, wherein act (c) comprises the act of:

disposing at least one of copper, nickel, and tungsten in the window.

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75. The method, as set forth in claim 72, wherein act (d) comprises the act of:

disposing a layer of silicon nitride over the first metal and the first layer of dielectric material.

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76. The method, as set forth in claim 72, wherein act (g) comprises the act of:

using immersion plating to plate the third metal onto the first metal.

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77. The method, as set forth in claim 76, wherein the third metal comprises silver.

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78. The method, as set forth in claim 72, wherein act (h) comprises the act of:

disposing germanium selenide over the third metal.

79. The method, as set forth in claim 72, wherein act (i) comprises the act of:

heating the third metal and the chalcogenide material.

80. The method, as set forth in claim 72, wherein act (i) comprises the act of:

irradiating the third metal and the chalcogenide material with ultraviolet radiation.

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81. The method, as set forth in claim 72, wherein acts (a) through (j) are performed in the order recited.

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